

## CLAIMS

What is claimed is:

1. A method of growing a nitride-based film, the method comprising:

applying a first precursor flux for a first element using a first pulse, wherein the first pulse has a first duration and wherein the first element comprises nitrogen; and

applying a second precursor flux for a second element using a second pulse, wherein the second pulse has a second duration, and wherein the second duration is not equal to the first duration.

2. The method of claim 1, further comprising applying a third precursor flux for a third element using a third pulse, wherein the third pulse has a third duration, and wherein the third duration is not equal to the first duration.

3. The method of claim 2, further comprising applying a fourth precursor flux for a fourth element using a fourth pulse, wherein the fourth pulse has the first duration.

4. The method of claim 3, wherein the nitrogen precursor flux comprises  $\text{NH}_3$ , the second precursor flux comprises TMG, the third precursor flux comprises TMI, and the fourth precursor flux comprises TMA.

5. The method of claim 1, wherein at least a portion of the first pulse is applied at the same time that at least a portion of the second pulse is applied.

6. The method of claim 1, wherein at least one of the first pulse and the second pulse has a non-rectangular waveform.
7. The method of claim 1, further comprising illuminating the nitride-based film with ultraviolet radiation.
8. The method of claim 1, wherein the nitride-based film is grown on a substrate comprising at least one of: lithium aluminate and silicon.
9. The method of claim 1, wherein the first precursor flux further comprises a plurality of subsequent pulses, wherein each subsequent pulse has the first duration, and wherein each subsequent pulse is separated from a previous pulse by a gap having the first duration.

10. A method of growing a nitride-based film, the method comprising:

applying a first precursor flux for a first element using a first series of pulses, wherein the first element comprises nitrogen; and

applying a second precursor flux for a second element using a second series of pulses, wherein at least a portion of a pulse in the second series of pulses is applied during at least a portion of a pulse in the first series of pulses.

11. The method of claim 10, further comprising applying a third precursor flux for a third element using a third series of pulses, wherein at least a portion of a pulse in the third series of pulses is applied during at least a portion of a pulse in the first series of pulses.

12. The method of claim 11, further comprising applying a fourth precursor flux for a fourth element using a fourth series of pulses, wherein at least a portion of a pulse in the fourth series of pulses is applied during at least a portion of a pulse in the first series of pulses.

13. The method of claim 10, further comprising illuminating the nitride-based film with ultraviolet radiation.

14. The method of claim 10, wherein a duration of a pulse in the second series of pulses is not equal to a duration of any pulse in the first series of pulses.

15. The method of claim 10, wherein a pulse in the second series of pulses has a non-rectangular waveform.

16. A method of growing a nitride-based film, the method comprising:
- applying a nitrogen precursor flux comprising  $\text{NH}_3$  using a first series of pulses; and
- applying a second precursor flux for a second element using a second series of pulses,
- wherein a pulse in the second series of pulses has a non-rectangular waveform.
17. The method of claim 16, wherein at least a portion of a pulse in the second series of pulses is applied during at least a portion of a pulse in the first series of pulses.
18. The method of claim 16, wherein each pulse in the first series of pulses has a non-rectangular waveform.
19. The method of claim 16, wherein a duration of a pulse in the second series of pulses is not equal to a duration of any pulse in the first series of pulses.
20. The method of claim 16, further comprising illuminating the nitride-based film with ultraviolet radiation.